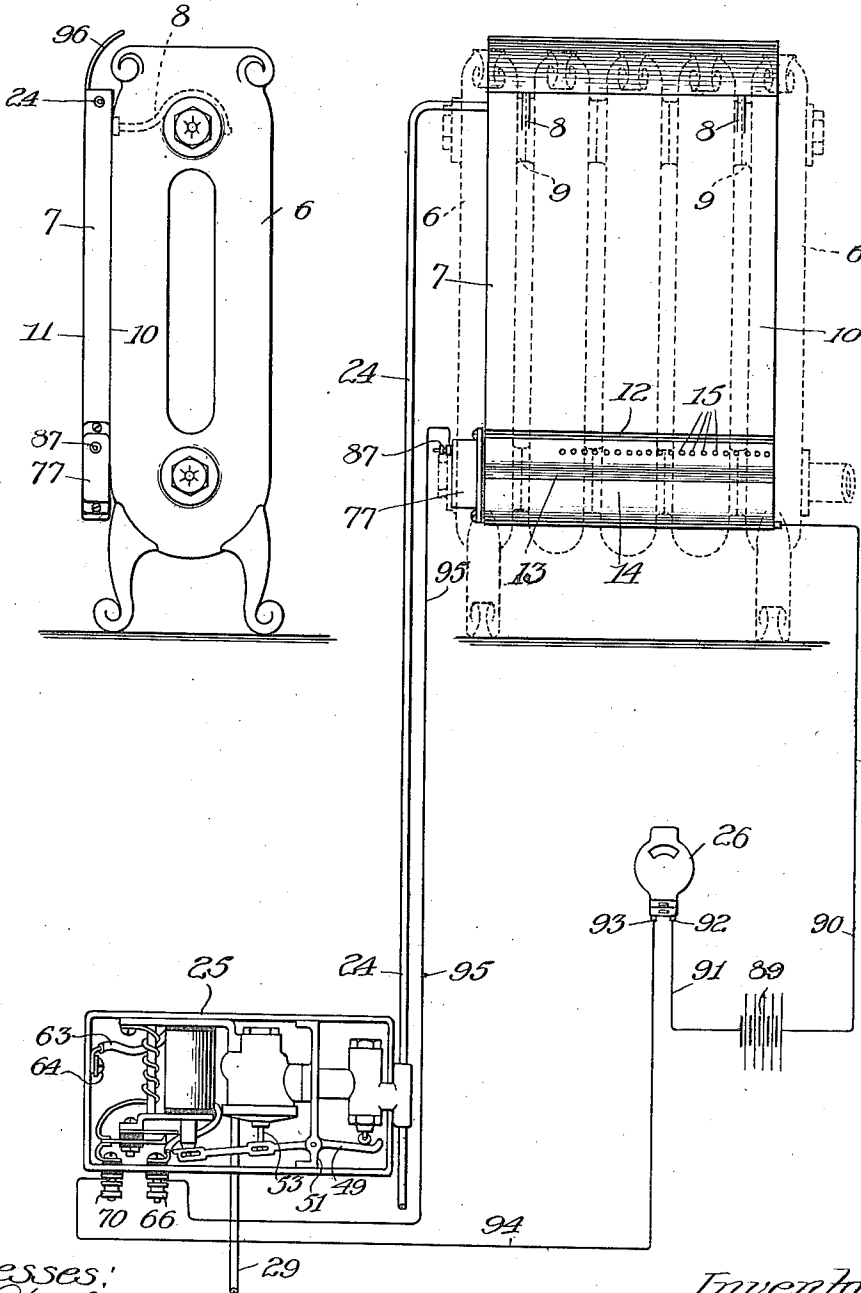


1,294,074.

Fig. 2.

Fig. 1.



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HUMIDIFYING APPARATUS.
APPLICATION FILED JAN. 10, 1918.

Patented Feb. 11, 1919.
2 SHEETS—SHEET 2.

1,294,074.

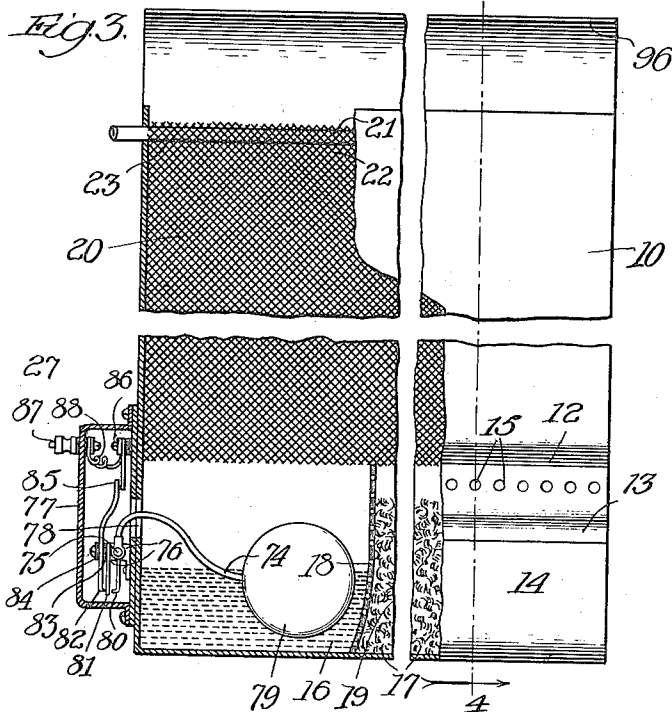
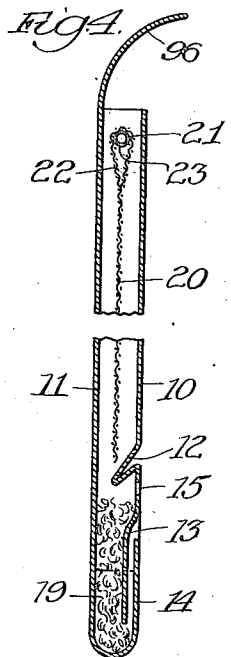
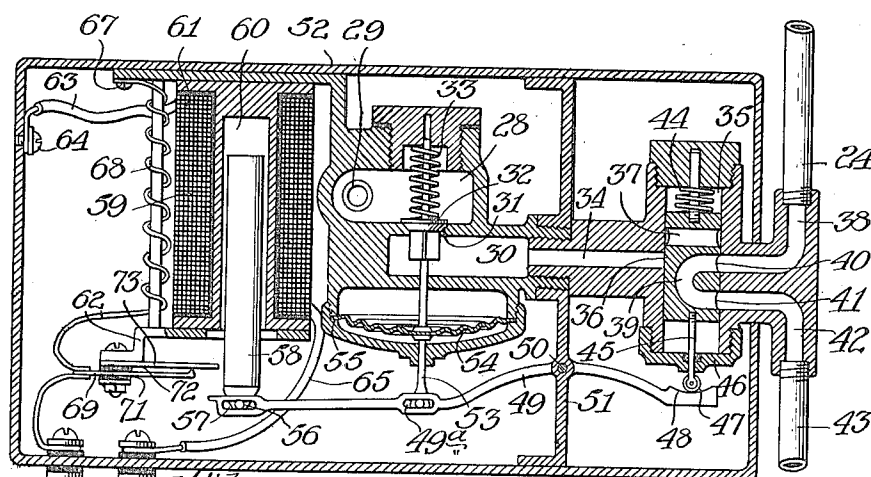


Fig. 5.



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UNITED STATES PATENT OFFICE.

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HUMIDIFYING APPARATUS.

1,294,074.

Specification of Letters Patent.

Patented Feb. 11, 1919.

Application filed January 10, 1918. Serial No. 211,137.

To all whom it may concern:

Be it known that I, GUY S. FABER, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented a new and useful Improvement in Humidifying Apparatus, of which the following is a specification.

My invention relates more particularly, to humidifying apparatus for use, more especially, in connection with steam, or hot water, radiators, for maintaining a desirable amount of moisture in the room, or rooms, heated by the radiator.

One of my principal objects is to provide a new and improved construction of vaporizing pan which shall operate in a very effectual manner to expose water supplied thereto, to the heat of the radiator for vaporizing it and discharging the maximum amount of moisture into the room commensurate with the amount of heat given off by the radiator, and to provide against leakage of the water from the vaporizing pan either by dropping from the vaporizing surface of the vaporizing pan or by overflow; another of my principal objects is to provide in an automatically, operating humidifying system, means for feeding the water to the vaporizing surface and automatically draining the pipes through a moisture-controlled device, whereby the feed of water to the vaporizing surface shall take place when the air in the room is too dry, and the feed of water will be arrested and the vaporizing device be drained of the contained-water, thereby preventing freezing of the water in the system; another principal object is to provide an apparatus wherein water will be supplied to a vaporizing surface only when the radiator with which the vaporizing surface coöperates, is hot and when the air in the room in which the radiator is located contains less than a predetermined amount of moisture and, when the vaporizing device involves a receptacle for water, the control of the supply of water to the pan determinable on the two conditions above referred to, and a further condition that there be less than a predetermined amount of water in the pan, whereby overflow of the water in the system is prevented and at the same time the conditions are rendered fit for supplying to the air in the room, the desired amount of moisture.

Referring to the accompanying drawings:

Figure 1 is a view somewhat in the nature of a diagram of a radiator equipped with automatically-operating humidifying apparatus constructed in accordance with my invention, the radiator being shown by dotted lines. Fig. 2 is a view in end elevation of the radiator shown in Fig. 1 with my improved vaporizing pan mounted thereon. Fig. 3 is a broken, enlarged view in longitudinal, vertical elevation of my improved vaporizing pan. Fig. 4 is a broken section taken at the line 4 on Fig. 3, and viewed in the direction of the arrow; and Fig. 5, a view in vertical elevation of the electrically-operated mechanism for controlling the supplying of water to the vaporizing pan and the draining of the latter.

In the drawings, a radiator, either steam or hot water, is illustrated at 6, this radiator being equipped with a water vaporizing pan 7 constructed in accordance with my invention, which, by preference, is adapted to be supported along the rear side of the radiator as represented in Fig. 2, as through the medium of forwardly projecting hooks 8 secured to the pan and hooked over the adjacent circular bosses commonly provided on steam radiators. By preference, the pan 7 is of general rectangular form as shown, its opposite front and rear walls 10 and 11 being spaced apart a relatively slight distance only, with the pan closed at its bottom. The metal forming the side 11 is bent forwardly and upwardly to form the curved bottom of the pan and terminates above the bottom of the pan, as shown in Fig. 4. The metal forming the side 10 of the pan is deflected inwardly throughout the length of the pan, as represented at 12, to form a ledge extending preferably across the center of the pan, as shown in Fig. 4, and its lower portion deflected, as represented at 13 to be spaced from the up-turned portion 14 of the metal forming the rear wall 11, with the lower edge of the portion 13 reaching short of the bottom of the pan. The portion of the wall 10 between the deflected portions 12 and 13 is perforated, as represented at 15, preferably throughout the length of the pan. The compartment thus provided in the bottom of the pan is divided into two compartments—sections 16 and 17, by means of a perforated partition 18, the compartment 16 operating as a float chamber, as hereinafter

described, and the compartment 17 being provided for receiving an absorbent material, as for example metallic wool, represented at 19 and which extends preferably slightly below the line of apertures 15. The pan also contains a surface over which the water to be vaporized is spread to present a relatively wide surface to the heat radiated from the radiator. This surface, by preference, is formed of wire mesh represented at 20 which embraces, and is supported by, a pipe 21 secured in the upper end of the pan and extending throughout the length of the latter. The wire mesh 20, which preferably extends substantially the full length of the pan, is looped about the pipe 21, as shown in Fig. 4, and into the looped portion 22 and the screen thus provided, water admitted to the pipe 21, discharges through downwardly opening perforations provided in the underside of this pipe, preferably at spaced intervals throughout its entire length.

Water is supplied to the pipe 21 for discharge therethrough upon the screen 20 for subjection to the heat of the radiator to vaporize it, through a pipe 24 which, in the particular arrangement illustrated, extends downwardly to an electrically-controlled apparatus represented at 25, and which may be located in the basement of the building, for controlling the supplying of water to the vaporizing pan under variations in the moisture-content of the air.

The apparatus, as shown, is designed to be operated only when heat is in the radiator and the moisture-content of the air has dropped below a certain per cent., and in carrying out this feature of the invention, I provide in the room in which the radiator is located, any suitable form of hygroscopic device represented diagrammatically at 26 and which would be provided with electrical contact making-and-breaking devices operating to close the circuit through the hydrostat when the moisture surrounding it becomes reduced below a certain per cent. and to break the circuit when the moisture-content reaches a certain degree. The apparatus also involves a thermostatic switch, represented at 27, which is subject to the heat of the radiator and which, when the radiator is hot, is caused to close the circuit at this point, this device 27 being shown in connection with a float-controlled switch device cooperating with the pan.

The apparatus represented at 25 comprises a chamber 28 for connection at 29 with a supply of water under pressure, as for example the usual service pipes in houses, a second passage 30 communicating with the passage 28 through a port 31 controlled by a valve 32 which is normally closed under the action of a spring 33, the passage 30 communicating with a passage 34 opening into a cylinder 35 containing a

slide-valve 36 presenting a cross-port 37 adapted to be moved into and out of registration with the passage 34, and a passage 38 in the cylinder wall 35 and in communication with the pipe 24. The piston 36 also contains a U-shaped port 39 which is adapted to register at its open ends 40 and 41 with the passage 38 and a passage 42 which connects with a pipe 43, which in practice would lead to a drain such as a sewer. The valve 36, which is backed by a coiled spring 44 tending to move the valve downwardly, operates when the valve is raised, as shown in Fig. 5, to connect the pipe 24 with the pipe 43 through the passage 39, and when in lowered position, to disconnect these pipes, and through the medium of the port 37 connect the passage 34 with the pipe 24 for supplying water to the vaporizing pan. The valve 36 is provided at its lower end with a stem 45 guided in an opening in a cap-plate 46 on the casing in which the valve 36 reciprocates, the lower end of this rod, which carries a roller 47, bearing against the upper, curved, surface 48 of a lever 49 fulcrumed at 50 on a partition 51 formed as a part of the casing 52 in which the mechanism now being described is located. The lever 49 at the side of its pivot 50, opposite that at which it is engaged by the roller 47, is pivotally connected, as indicated at 49^a, with the lower end of the stem 53 of the valve 32, this stem being equipped with a flexible plate 54 held tightly at its edges 55 and operating to prevent leakage. Beyond the pivotal connection 49^a of the lever 49 with the stem 53, this lever is pivotally connected through the medium of a pin 56 extending into a slot 57 in this lever, with the core of a solenoid device 59, the pin 56 being on the lower end of the core. The core 58 is movable up and down in the space 60 surrounded by the solenoid coil 61, which is supported from a bracket 62 carried by the casing 52. The terminal 63 of the solenoid is grounded on the casing 52, as indicated at 64, and its other terminal 65 is connected with the binding-post 66. Grounded on the casing 52 at one end, as indicated at 67, is a resistance coil 68, its other terminal being connected with a contact spring 69 electrically connected with the binding-post 70, and supported from the bracket 62 between two strips of insulation 71 and 72, the contact spring 69 cooperating with a spring contact strip 73, which is in electrical contact with the bracket 62 and thus grounded and is insulated from the contact 69 by the insulation 72, this resistance coil operating for a purpose hereinafter described. The circuit controlling-mechanism 27 comprises a lever 74 pivoted at 75 on a stud 76 secured to one end of the vaporizing pan and located within a supplemental casing

77. The lever 74 extends into the lower portion of the vaporizing pan through an opening 78 which is located above the highest level of water in the pan, to prevent
 5 water floating into the supplemental casing 77, this lever being equipped with a float 79. The lever 74 is provided with a depending arm 80 which coöperates with a contact 81 of springy material secured to the stud 76 and thus grounded on the radiator, the contact 81 coöperating with a contact 82 secured on this stud, but insulated therefrom through the medium of the insulating sections 83 and 84, the upper end
 10 of the contact 82 extending into a position for coöperation with a thermostatically-controlled contact 85 secured to, but insulated from, a stud 86, secured to the pan. The contact 85, which is connected with the binding-post 87 by a wire 88, is so constructed, as is well known in the art, and is so positioned relative to the upper end of the contact 82 that when the radiator is hot, it will be caused to be in engagement with
 25 the contact 82, as shown in Fig. 3, but when the radiator is cold, it will be spaced therefrom, interrupting the circuit at this point. As shown, the source of electrical energy for controlling the operation of the automatic mechanism, is a battery represented at 89, one terminal of this battery being connected, by means of the wire 90, with a portion of the pan, as indicated in Fig. 1 and thus grounded and in electrical connection with the contact 81. The other
 30 terminal 91 of the battery connects with one of the terminals 92 of the hydrostat 26, the other terminal 93 of the hydrostat being connected, by means of the wire 94, with the binding-post 70. A wire 95 connects the binding-post 66 with the binding-post 87.

The operation of the apparatus is as follows:

The apparatus is shown in the drawings
 45 in the position it assumes when the room in which the radiator is located is heated, the air in the room is charged with the amount of moisture provided as the maximum by the hydrostat, and the trough-shaped bottom of the vaporizing pan is charged with water. In this condition of the apparatus, the valve 36, by reason of the weight imposed by the core 58 (the solenoid 59 being deenergized) is in the position shown in Fig. 5 in which
 50 the supply of water to the pipe 24 is shut off and the pipe 24 is opened to the drain 43, the valve 32 also closing the passage 28 to the passage 30, the water in the pipe 24 in this position of the mechanism draining
 60 therefrom through the pipe 43. When the moisture in the room in which the hydrostat 26 is located, drops below a predetermined per cent., the circuit is closed in the hydrostat and if the water is low in the vaporizing pan, the circuit is closed between the

contacts 81 and 82, which are in series with the hydrostat 26. When these conditions occur, current is caused to traverse the solenoid coil which lifts the core 58 rotating the lever 49 in a clockwise direction in Fig. 5, 70 which opens the valve 32 and lowers the valve 36 to a position in which the passage 34 and pipe 24 are in communication. Water from the supply pipe thus flows through the passages 28, 30, and 34 and
 75 through the pipe 24 and downwardly through the perforations 23 in the pipe 21 upon the screen 20 where it is subjected to the heat of the radiator, thereby becoming vaporized and discharged into the atmosphere in the room in which the radiator is located, the pan, by preference, being provided at its upper end with a forwardly extending deflector 96 to deflect the moist air in a forward direction.

It will be noted that by the construction of vaporizing pan employed, ample provision is made for the circulation of air from the bottom upwardly through the pan and out through the upper, open, end of the latter, whereby the maximum charging of air with moisture may be effected.

In the operation of the apparatus as just stated, current flows from the battery 89, through wire 91, hydrostat 26, wire 94, binding-post 70, contact 69, contact 73 to ground, thence through solenoid coil 61, binding-post 66, wire 95, binding-post 87, wire 88, contact 85, contacts 82 and 81 to ground on the vaporizing pan, and from the pan through
 100 the wire 90 to the battery 89.

In the operation of the lever 49, as above stated, under the action of the solenoid 61 when energized, the end of this lever engages the spring contact 73, lifting it free
 105 from the contact 69 whereupon the current instead of passing from the contact 69 direct to ground through the contact 73, traverses the coil 68 thus caused to be in series with the solenoid coil 61 and which by being
 110 properly proportioned, as is well understood in the art, prevents the burning out of the coil 61.

When the moisture to which the hydrostat 26 is subjected exceeds the degree at which
 115 the latter operates to break the circuit, the circuit is broken through the hydrostat, thus permitting the parts of the mechanism shown in Fig. 5 to return to the position shown in this figure, wherein the supply of
 120 water to the water vaporizing pan is arrested and the pipes 24 and 21 automatically drained. Also should the water in the pan rise therein above a given level, the float 79 operating on the lever 74 causes its finger 80
 125 to move in a direction for permitting the spring contact 81 to spring apart from the contact 82.

It will be noted from the foregoing description that by the provision of the elec- 130

- trically-controlled devices referred to, the danger of freezing of the water in the system is prevented, as the water is drained from the system in the event that the current is broken at the contacts 82 and 85. Furthermore, it will be noted that water will not be supplied to the vaporizing pan unless three factors are present, namely the radiator must contain heat, second, the air surrounding the hydrostat 26 must contain moisture below a given degree, and third, the water in the pan must be below the maximum water-level. Thus adequate provision is made against overflowing of the system under the different conditions presented and, by providing a hydrostat, which may be set at different degrees of moisture, the air may be caused to be impregnated with the amount of moisture desired.
- It may be further stated as regards the vaporizing pan that by constructing the bottom of the pan, as explained, leakage of the water from the pan by dripping from the screen, is prevented.
- While I have illustrated and described a particular construction embodying my invention, I do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered without departing from the spirit of my invention, it being my intention to claim my invention as fully and completely as the prior state of the art will permit.
- What I claim as new and desire to secure by Letters Patent is—
1. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying water to said vaporizing means, and means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means, for controlling the actuation of said second-named means and draining the water from the portion of the apparatus through which the water is supplied to the vaporizing means when the supply thereto is shut off.
 2. In apparatus of the character set forth, the combination of water-vaporizing means, valve means for controlling the supply of water to said vaporizing means operating when in one position to permit water to pass to the vaporizing means and when in another position to shut off the supply of water thereto and drain the water from the portion of the apparatus through which the water is supplied to the vaporizing means, and an electrically-controlled device for controlling the position of said valve means, and means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means for controlling the actuation of said valve-controlling means.
 3. In apparatus of the character set forth, the combination of water-vaporizing means, valve means for controlling the supply of water to said vaporizing means operating when in one position to permit water to pass to the vaporizing means and when in another position to shut off the supply of water thereto and drain the water from the portion of the apparatus through which the water is supplied to the vaporizing means, and an electrically-controlled device for controlling the position of said valve means and operating when current is supplied thereto to hold said valve means in position for supplying water to said vaporizing means, and means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means, to close the circuit through said second-named means when the moisture-content of the atmosphere becomes decreased below a certain degree, and to break the circuit through said second-named means when the moisture-content of the atmosphere increases beyond a certain degree.
 4. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying water to said vaporizing means, means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means for controlling the actuation of said second-named means and means for draining the water from the portion of the apparatus through which the water is supplied to said first-named means when the supply thereto is shut off.
 5. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying water to said vaporizing means, means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means for controlling the actuation of said second-named means, means controlled by the temperature condition at said first-named means for preventing actuation of said second-named means to supply water unless said first-named means are subjected to heat of a given temperature, and means for draining the water from the portion of the apparatus through which the water is supplied to said first-named means when the supply thereto is shut off.
 6. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying water to said vaporizing means, means operating responsively to changes in the moisture-content of the atmosphere surrounding said last-named means for controlling the actuation of said second-named means, and electrical means arranged in series with said second-named means, for controlling the opening and closing of the circuit depending upon the temperature condition existing

ing, and means for draining the water from the system supplying water to said first-named means when the supply thereto is shut off.

5 7. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying water to said vaporizing means, means operating responsively to changes in the moisture-content of the atmosphere surrounding
10 said first-named means for controlling the actuation of said second-named means, means controlling the operation of said second-named means and operating when the
15 water in said water-vaporizing means rises to a certain level to cause said second-named means to be in a position for shutting off the supply of water to said water-vaporizing means, and means preventing said second-named means from operating to supply water to said water-vaporizing means unless a certain temperature condition exists.

8. In apparatus of the character set forth, the combination of water-vaporizing means, electrically-controlled means for supplying
25 water to said vaporizing-means, and means controlling said second-named means and operating, when the temperature of said vaporizing-means drops to a predetermined degree, to shut off the supply of water to said vaporizing means and drain the water from the portion of the apparatus through which the water is supplied to the vaporizing-means.

9. In apparatus of the character set forth, the combination of water-vaporizing-means, electrically-controlled-means for supplying water to said vaporizing-means, means operating responsively to changes in the moisture content of the atmosphere surrounding said
40 last-named means for controlling the action of said second-named means, means controlled by the temperature condition at said first-named means for preventing actuation of said second-named means to supply water unless said first-named means are subjected to heat of a given temperature, said third-named and said fourth-named means being disposed in electrical series, and means for draining the water from the portion of the
50 apparatus through which the water is supplied to said first-named means when the supply thereto is shut off.

10. In apparatus of the character set forth, the combination of water vaporizing-means, electrically-controlled-means for supplying water to said vaporizing-means, means controlling the operation of said second-named means and operating when the water in said water-vaporizing-means rises

to a certain level, to cause said second-named means to be in a position for shutting
60 off the supply of water to said water-vaporizing-means, and means preventing said second-named means from opening the supply of water to said water-vaporizing-means unless a certain temperature condition exists. 65

11. In apparatus of the character set forth, the combination of water-vaporizing means, an electrical circuit, means in said
70 circuit for supplying water to said vaporizing-means, means in said circuit controlling the operation of said second-named means and operating when the water in said water-vaporizing-means rises to a certain level, to so affect said circuit as to cause said second-named means to be in a position for shutting off the supply of water to said water-vaporizing-means, and means in said circuit operating to so affect said second-named means as to prevent the latter from
80 operating to supply water to said water-vaporizing means unless a certain temperature condition exists.

12. In apparatus of the character set forth, the combination of water-vaporizing-means, an electrical circuit, means in said circuit for supplying water to said vaporizing-means, means operating responsively to changes in the moisture content of the atmosphere and surrounding said first-named means for so affecting said circuit as to cause said second-named means to supply water to said vaporizing-means when the moisture content of the atmosphere surrounding said second-named means drops below a certain degree, means operating to so-affect said circuit as to cause said second-named means to supply water to said water-vaporizing-means when the water in the latter drops to a certain level, and means operating to so affect said circuit as to prevent said second-named means from operating to supply water to said water-vaporizing means unless a certain temperature condition exists. 105

13. In apparatus of the character set forth, the combination of water vaporizing means, means controlling the supply of water to said vaporizing means, means operating responsively to changes in the moisture-content in the atmosphere surrounding said last-named means, for controlling the actuation of said second-named means, and means for draining the water from the portion of the apparatus through which the water is supplied to said vaporizing means when the supply thereto is shut off. 115

GUY S. FABER.